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SELECTIONS ON HYDROGEOLOGY AND ENGINEERING GEOLOGY

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SELECTIONS ON HYDROGEOLOGY AND ENGINEERING GEOLOGY

/The following are translations of selected articles from Shui-wen Ti-chih Kung-ch'eng Ti-chih, No 5, Peiping, 12 May 1959./

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ADAPT TO NEW SITUATIONS IN THE GREAT LEAP FORWARD STRENGTHEN LEADERSHIP OF HYDROGEOLOGICAL AND ENGINEERING GEOLOGICAL WORK

/Following is the translation of an article by Chou Kang (周剛), Director of the Bureau of Hydrogeology and Engineering Geology, containing excerpts from addresses delivered at the national convention of geological workers in Shui-wen Ti-chih Kung-ch'eng Ti chih /Hydrogeology and Engineering Geology/, No. 5, 12 May 1959, pages 3-6/

I. An Enormous Advance in Hydrogeological and Engineering Geological Work in 1958

During the last several years hydrogeological and engineering geological units, under the leadership of party and government leaders and with the assistance of Russian experts, have been set up throughout the nation in cities, provinces and autonomous regions. Main tasks engaged in by the units fall respectively in the following four groups:

A. To assure the successful construction of hydroelectric power plants we engaged, during the last several years, in engineering geological surveys of different designing stages for more than two hundred large-size reservoirs and hydroelectric stations and thereby supplied the engineering geological information needed for the compilation of planning and zoning. We also gave reports of essential points of planning and zoning of river valleys for such river valleys as those of the Yellow River, Huai River, Liao River, Yangtze River and so forth.

In the first five-year plan for both new construction and restoration of old railroads, we undertook preliminary and final engineering geological surveys for engineering projects for such railroads as the Feng-t'ai--Sha-ch'eng, Chi-ning--Erh-lien, T'ien-shui--Lan-chou, Pao-ch'i --Ch'eng-tu, Lan-ts'un--Yent'ai, Yingt'an--Hsiamen.

In the meantime we did the engineering geological survey for the world renowned Wu-Han bridge over the Yangtze connecting South and North China and furnished the necessary engineering geological data for the designing and estimation of the project.

For the building of iron and steel centers at Pao-t'ou, Wu-Han, and in the Northwest for the city planning of Peiping and other such industrial cities as Si-an, Hsing-p'ing and Pao-ting and for the construction of the Chan-chiang harbor, we provided the needed hydrogeological

and engineering geological information, Moreover, we have undertaken engineering geological surveys for foundations of large factories and industries and hydrogeological surveys for water supply.

In addition to what was mentioned above, we have conducted a great variety of various types of engineering geological and hydrogeological surveys.

B. Starting in 1955 special regional units have been set up one after another throughout the country. Thus far they have conducted and completed 1:200,000 and 1:500,000 regionwide hydrogeological surveys in such arid or semi-arid regions as Sinkiang, Tsaidam, the Ho-hsi corridor, the Shensi loess region, the Inner Mongolian prairie, the Sungari-Liao plain, the North China plain, the Ch'eng-tu plain in Szechwan Province and coastal regions like the Lei-chou peninsula and Chiao-tung peninsula. We have furnished the hydrogeological information needed for regional plannings in irrigation by means of underground water and agricultural development by the joint use of surface and underground water.

C. Hydrogeological work in mine areas has been started so as to provide the mining industry with hydrogeological information in mine areas for their designs and mining.

D. Scientific research institutes have been set up and have engaged in studies of mineral waters, hydrogeological and engineering geological conditions of such things as quarternary strata and loose ground bases in areas like the arid region in the Ho-hsi corridor, the Karst region of the Yangtze main stream, the loess regions in the eastern part of Kansu province, the Tou river reservoir at T'ang-shan, Hopei, etc. A 1:3,000,000 atlas of the hydrogeological regions of China was compiled and published.

In 1958, during the nationwide rectification movement we carried out, with resolution and on basis of winning the greatest victory, the general line as raised by the party: "Pep up working strength and strive for an upper hand to build Socialism in a better, faster, and more economical manner." With the spirit of anti-conservatism, sincerity and impartiality we eliminated a number of superfluous and unnecessary regulations and requirements in our work which thus enabled us to call a number of on-the-spot improvised meetings in which, all told, more than 170 experiences were exchanged and extended. Timely guidance enabled us to enact such working rules and regulations befitting the practical conditions of our country as "hydrogeological survey requirements for medium and small mine-beds," engineering geological survey requirements for large reservoirs and dam sites, map-making methods (1:200,000 -- 1:500,000) and comprehensive hydrogeological sample maps."

The nationwide geological policy was carried through with determination. Power was delegated on down to the widely established provincial and regional hydrogeological and engineering-geological special units of which the original fourteen groups have been expanded to twenty eight. Under the direct leadership of local party leaders and provincial, city and regional (autonomous) bureaus of geology, hydrogeological and engineering geological work have made an obvious leap forward. Their

enormity of their achievement is shown in the following:

1. The amount of hydrogeological and engineering geological surveying in various scales actually done in 1958 is eight times that of 1957 and 2.2 times of that done during the entire first five year plan. General hydrogeological surveys of scales of 1:200,000 and 1:500,000 in arid and semi-arid regions amounted to 230% of that planned by the government. That means a completion of more than one third of the total area of arid and semi-arid regions in urgent need of general hydrogeological surveys. Planning information has been supplied for opening up underground water to expand agriculture, forestry and pastoral industry. Hydro-geological foundations were laid for carrying on desert control and morphological alterations of nature.

For better understanding of underground water conditions so as to make underground water better serve industrial and agricultural production, long-term underground water movement observation stations in Peiping, Pao-t'ou, Hu-ho-hao-t'e, Pao-ting, Si-an and other places have been expanded and new stations have been set up in Cheng-chou, Chi-nan (Tsinan) Urumchi and a few other places. Thus preparatory work has been done for the establishment of a network of underground water movement observation stations covering the entire country.

2. In regard to hydraulic-engineering geological surveys, we completed ahead of time the engineering geological survey for the technical planning and designing of hydro-electric power stations at San-men Gorge and the mouth of Tan-chiang. Engineering geological surveys for the designing and planning of large, medium and small hydro-electric and irrigation engineering projects have been undertaken in 612 places which is 47 times that of 1957 and three times as many as the total done in the first five year plan. Besides, we have undertaken the planning and zoning of the Sungari River and the comparative engineering geological surveys for Sung-Liao canal and the dam section of the Three Gorges (San-hsia) Hydro-electric station on the Yangtze River.

3. With regard to city water supply hydrogeological surveys for the water supply of 34 industrial cities have been done.

4. Hydrogeological work in mine areas has suddenly increased in both variety and areas as mines are discovered. Pursuant to the principle of "simultaneous probing, mining and collecting of hydrogeological data by means of full utilization of geological survey-probing engineering," timely hydrogeological data needed for the opening and development of medium and small mineral beds and pockets were furnished. This assured the amount of deposit to be reported on schedule.

5. Close coordination between scientific research and studies of hydrogeology and engineering geology has also produced great results. Research work was conducted in order to find minerals and mines by means of chemical analysis of water and mineral water and in order to determine hydrogeological and engineering geological conditions and hydrogeology in mineral beds in such regions as loess areas where water is to be guided in from T'ao river, the dilapidated banks of San-men Gorge reservoir, the dam section in the Three Gorges of Yangtze, the arid region in Inner

Mongolia and so forth. Aside from this, a 1:4,000,000 regional map of ground water in China was compiled.

6. Survey-exploration Equipment. Technical ability in the use of the probing-drilling depth gauge has been greatly improved. Mechanical drills of all types have been more than doubled since 1957. The amount of drilling-probing done in 1958 was 1.8 times that of the total done in the first five year plan. The yearly average of monthly efficiency of the mechanical rock drill reached 237 meters, 20 per cent over the planned figure and 61 per cent higher than that of 1957. Water-pumping (out) tests totaled more than 57,800 hours, an increase of 114 per cent over that of 1957. Force pumping tests totaled more than 19,700 hours, an increase of 46 per cent over 1957. Costs of all types of work were also greatly lower than those of 1957.

The total number of personnel was about double that of 1957. Hydrogeological technical personnel in mine areas increased by more than one-third. Quite a number of provinces and regions organized on-the-job training classes for their apprentices. According to incomplete statistics, more than 350 basic personnel were trained in this manner. On top of these they trained a number of personnel simple and elementary knowledge in geology for work in the local areas. For instance, in the province of Shantung alone over 500 people of this category were trained.

Although there were enormous achievements in hydrogeological and engineering geological work during the past year, there were also some shortcomings. These shortcomings are only minor in relation to all the tasks but they must be given serious attention. One of the most serious inadequacies is the poor coordination between mineral survey-exploration and hydrogeological surveying in mine areas. In carrying out regional general hydrogeological surveying, probing-drilling could not catch up with others. Findings were not compiled and edited in time to meet deadlines for submitting reports. There were shortages of all types of special equipment such as pipes of large caliber, mechanical smashing drills and all types of water pumps. This seriously handicapped probing-drilling and pumping operations. All these difficulties are to be solved and conquered from now on.

II. Under New Situations Hydrogeological and Engineering Geological Work Must Make An Even Greater Leap Forward

In the text of Summary of Work Done in 1958 and our Mission in 1959 which was prepared by deputy minister Li in behalf of the ministry, the following things were clearly specified: In 1959 general hydrogeological and engineering geological surveys will find water sources for industries, agriculture and pastoral industry; engineering geological surveying must be actively conducted for large-size hydraulic and irrigation centers and special engineering projects; in the meantime, to meet the demands of many localities, engineering geological surveying will be extended to medium and small hydroelectric projects; further hydrogeological work in mine

areas will be intensified. As demanded by the projected overall greater leap forward in all fields, hydrogeological and engineering geological work must make greater advances accordingly. What are the main things the newly-projected situation will demand from hydrogeological and engineering geological work?

A. The rich and abundant hydraulic and irrigational resources in our country amount to a yearly average of more than 2,630,000,000,000 cubic meters of water, which ranks third in the world. Hydroelectric potential is about 540,000,000 kilowatts, which ranks first in the world. An even greater leap forward in industry and agriculture will make the development of irrigational and hydraulic resources still more imperative.

However the geographical distribution of irrigational and hydraulic resources is utterly unbalanced. About one third of the total area of approximately 9,630,000 square kilometers of the nation lies to the south of the Yangtze, an area which possesses two thirds of the nation's water supply. Whereas the Yellow River valley and the arid and semi-arid regions in the northwest, over one-third of the country's area, have a total water supply of merely 1/26 of the national total. The approximate total amount of water supply needed for the approximately 3,300,000,000 mous of farm, forestry and pasture land is about 600,000,000,000 cubic meters. This area has only a little more than 110,000,000,000 cubic meters and is about 500,000,000,000 cubic meters short. To insure an adequate supply of water for industry, agriculture, and pasturage in the area, a hydrogeological general-survey must be conducted without delay so as to gather and supply information for the opening up of underground water. Diverting water from the south to the north to balance the water supply in the country as a whole is also under consideration. Although rainfall is quite plentiful in the southern provinces, in general, some areas are also short of water due to poor topographical conditions. Therefore such areas, too, need a hydrogeological general survey.

B . To meet the rapidly increasing demand of electricity made by fast-growing industry, the populations of newly-developed and old cities and agriculture, our capacity for generating electricity must be boosted accordingly. In accordance with the policy "principally relying on hydroelectric power and regarding heat-generated electricity as supplementary" and the policy of "combining the utilization of large, medium and small (power plants)" as adopted by the central government, we must first of all guarantee the engineering geological survey for emphasized projects. Secondly, we must try to do as much as we can with engineering geological surveys for medium and small irrigation and hydroelectric engineering projects in the light of local needs. Last but not least, we have to prepare engineering geological data for the gigantic engineering project of diverting water in the south to the north.

C. The nationwide general survey for the exploration of mines and minerals scheduled for 1959 is greatly increased over 1958. In order to insure the timely reporting of mineral deposits, general survey and exploration of minerals must be closely coordinated with hydrogeological work in mine areas.

D. Since the campaign of water conservation, utilization and irrigation started, underground water movements are bound to show changes. Consequently we must fully understand the conditions and changes of underground water and prevent possible alkalization and salinification. For these reasons we have established a nationwide network of long term observation stations to watch underground water movement.

E. Industrial cities in the country are increasing everyday. So the responsibility of urban water supply also is increasing, especially under conditions of the unconcerted development of brother departments.

The above items fully indicate the new conditions and problems facing the nationwide Big Leap Forward. Having seen quite clearly the development of the new objective situation we are obliged to further develop and expand our special rank and file so that our mission and plan for the year 1959 can be fulfilled more practically and in a more advanced stage.

III. Some Problems and Opinions

In his opening speech Deputy Minister Ho said: "While handling jobs of critical importance attention and concern must also be directed to work in other related fields such as experimentation and research in hydrogeology and engineering geology, physical mining exploration and so forth, all of which are different phases of geology. They are of critical importance to the accomplishment of the central mission of geological work and have brought forth great achievements in the past. Comrades in charge at all levels should make appropriate arrangements and help these types of work continuously to consolidate, develop and raise their efficiency."

On basis of the above directions, a few humble and rudimentary opinions and ideas are herewith expressed in connection with the following problems for our comrades to study and discuss.

A. Since geological units were assigned to lower levels last year, hydrogeological and engineering geological special units have made faster growth under the leadership and guidance of and with cordial concern from party leaders of all levels and city, provincial and (autonomous) regional bureaus of geology. At present there are roughly three types of leadership among the hydrogeological and engineering geological units in the various provinces, cities and autonomous regions. First, brigades under direct jurisdiction of bureaus (of hydrogeology and engineering geology) are maintained to conduct all the hydrogeological and engineering-geological work in the provinces, cities and autonomous regions. Under the second type hydrogeological and engineering-geological brigades take care of only general survey and hydrogeological and engineering-geological work for engineering projects and partially for water supply, while hydrogeological work in mine areas is left for the department (provincial) of geology to handle. And finally, the third type is that under the province and bureau a department of hydrogeology and engineering geology is set up to

conduct all work. However there are exceptions where mine area hydrogeological work is still done by brigades after the department is set up. There are still other cases where personnel have two official titles--brigade and department co-exist--but with only one leadership group.

The experience gained in a year or so has proved that there are practical difficulties if we try to assign all the complex geological work for mine areas, general survey, engineering projects, water supply, observation stations and so forth to a single special production brigade to handle, for the areas are too scattered. The production jobs are too complex. Energy and strength of a single brigade is rather limited. Experience shows that if a brigade tries to take care of all things, it will not be able to do a good job for everything. It is often the case that one thing is well attended, but another thing is missed or neglected. As a result the overall work will be adversely affected. Besides, if hydrogeological work in mine areas cannot make corresponding progress to meet the great increase in duties of mineral exploration, timely reports on the quantity of mineral deposits will be affected. For these reasons we did a preliminary study which showed, under the new situations created by the ever-progressing hydrogeological and engineering-geological work, that the following two forms of leadership had better be adopted: (1) Every provincial bureau sets up a department of hydrogeology and engineering-geology and technically directs both the work of hydrogeology in mining areas and that of special brigades which are actually still under the direct control of the bureau. In provinces where there are greater hydrogeological tasks in mine areas, they may set up a hydrogeological department for mine areas to technically direct hydrogeological work for all mineral exploration groups. Special brigades, however, would still be independent production brigades under the direct jurisdiction of the bureau. (2) Groups or subgroups may be set up to meet practical working needs. The groups or subgroups so set up should still be under the direct control of the brigade so as to preserve special mobility. In the meantime assistance should be given special and county offices of geology to establish special teams, to train trainee-students recommended from lower levels and to build gradually backbone forces without weakening or interfering with the main working strength. Bureaus would be requested to strengthen their leadership and to conduct periodic checks and inspections. The chief engineer would be requested to take overall command of technical matters. Both administrative and technical personnel should seek for more directions from, report more to and strive to win support from the leadership.

B. Owing to the enthusiastic support of the provinces, special equipment in the country as a whole has rapidly increased. However due to the even faster increase of tasks to be handled by the 28 newly-organized groups and the 14 old and basic groups, equipment shortages appear more acute during the expansion. Inadequacy of variety in mechanical equipment and facilities has handicapped progress and affected both the quantity and the quality of the jobs. Difficulties in the supply of equipment still exist this year. In addition to asking comrade bureau heads and supply agencies to render more help, a few suggestions may be in order at this juncture for solving the difficulties:

1. Substitutes such as rib-filter water pipes, bamboo and wood pipes, cement-gravel pipes, asbestos-cement pipes and the like can be used together with the employment of mixed mud-water drilling.

2. We must make an effort to produce a certain amount of equipment, try hard to improve special equipment in factories and fully utilize the potentials of the repair shops. A repair shop of the Peiping group (geological) made two YKC drills which can get better specimen materials, both in quality and in quantity, than the rock-heart drills do. Furthermore, for an understanding of the conditions of shallow underground water in the quarternary loose stratum we should make and use dash-hit rotating shallow drills of different sizes. This kind of drill is easy to make, convenient to use, economical and suitable for special jobs.

3. Water pumps used in testing water drawn from under ground should, in accordance with different hydrogeological conditions, be of different types. It is understood that the Te-hsing group in Kiangsi initiated their own device and successfully made a kind of machine-powered rod-pulling water pump. Shantung, San-hsia, Tan-chiang and a number of other groups also made their water pumps. All groups are very short of water pumps. It is recommended that ways should be found to solve such difficulties.

4. All special groups which as yet have not had repair shop and laboratory are advised and urged to build such facilities of their own promptly, whereas those have such facilities should have them fully equipped and staffed so as to facilitate the smooth progress of their tasks.

C. Training and nurturing technical manpower to eliminate insufficiency in personnel is important. In addition to requesting the state to assign more in the allocation of college students to us, it is hoped that those colleges, schools and institutes which have not had as yet a department or division especially for hydrogeology and engineering geology can give some thoughts to setting up such a department or division. Shortages of personnel can still be mitigated by continued operation of short-term training classes and on-the-job training of apprentices. In Hunan more than one hundred were trained in the fourth or last quarter of last year (1958) in this manner and the personnel thus trained have joined the working force this year. Szechwan (Ssuch'uan) Kwangsi, Kweichow and Yunnan all trained some personnel in this manner. In so doing, the intention is to strengthen, to boost and further develop this army under the personal support and cultivation of comrade bureau heads and to make it move forward like the stampede of ten thousand stallions.

After consulting allthe provinces, the plan for 1957 has been set as final and should be regarded as a great leap forward. Looking at the plans submitted last year by all the provinces, cities and autonomous regions we found, on the whole, that the planning and arrangements of newly-established groups were more feasible, while some older groups still had unused potential that could be exacted. As to how to program better, further deliberations and considerations seem to be worthwhile.

In order to have control over the completion of special plans, the ministry and department should give directions through a unified

downward channel. All provincial, municipal (special) and autonomous regional bureaus of geology ought to submit consolidated reports with statistics separately compiled.

General surveys of hydrogeology during 1958 received much help from diligent-worker students of geology from all colleges and universities. The achievements were tremendous. However, in some of the areas exploration could not catch up and the surveying and drilling fell behind. In programming the amount of drilling-probing for 1959, 1958 starts should be taken into consideration so as to, figuratively speaking, turn semi-finished things into finished products. Otherwise, our diligent worker-student would have someone to blame.

E. Hydrogeological work in mine areas permits reasonable mining of minerals and provides planning and designing agencies with the necessary hydrogeological and engineering-geological information. The trouble is, however, that in some mine areas, due to the disproportion of geology and hydrogeology, the collection of hydrogeological and engineering geological data was neglected at the time of general geological surveying and exploratory probing or done toward the end of the exploratory probing with other work in order to get a clear understanding of the hydrogeological and engineering-geological conditions. The result was "poor effect with added work," which is a waste. Furthermore reports of mineral deposits are, due to this waste of time, submitted behind schedule.

Hydrogeological work is an integral part of geological exploration and should be closely coordinated and carried on simultaneously with geological work in general. Hydrogeological reports should be presented at the time of concluding exploration to be used in the designing and planning of production.

The trend of the overall Big Leap Forward in 1958 will necessarily encourage the hydrogeological and engineering-geological work in 1959 to continue at an even greater pace of forward-leaping and development. In this unusual time of the high speed advance of socialist construction, one day's work is equivalent to that of twenty years. Let us join hands under the correct leadership of the party and the direct leadership of ministry, and group to carry through with determination the general line as raised by the party: "Pep up working strength and strive for an upper hand to build Socialism in a better, faster and more economical manner." We must, execute in earnest partywide and nationwide directions with complete reliance on the people. By means of selfless hard work in 1959, even more striking achievements than those of 1958 will certainly emerge.

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SOME IDEAS ON HYDROGEOLOGICAL WORK IN SOME AREAS OF KWANGTUNG AND KWANGHSI PROVINCES

/Following is the translation of an article by the Bureau of Hydrogeology and Engineering Geology in Shui-wen T'i-chih Kung-ch'eng T'i-chih (Hydrogeology and Engineering Geology, No. 5, 12 May 1959, pages 6-8/

Editor's note: From 8 to 24 January of this year (1959) the director of the Bureau of Hydrogeology and Engineering Geology, Comrade Chou Kang (周 剛), accompanied by Hydrogeological expert Ah-chia-pi-yeh-fu (阿加比也夫) and Hsu Kuei-sen (許貴生), made an inspection tour during which they directed hydrogeological and engineering geological work in the Chuang (僮) Autonomous Region in Kwanghsi and some areas under the jurisdiction of Kwangtung Bureau of Geology. They heard the hydrogeological summary reports from five of the geological field-work groups: Kwanghsi Hydrogeological and Engineering Geological Group, and groups at the Fu-sui Coal Mine, the Fu-chung iron mine, the Chang-t'un lead and zinc mine in Kwanghsi and the Lien-yang coal mine in Kwangtung. They visited four field groups: the group at the Hai-yang iron mine in Kwanghsi, the water supply group in Canton, groups at the Fan-K'ou multiple metal mine and the Yang-ch'un coal mine in Kwangtung. We now publish some of the findings --some problems, suggestions and ideas--of the four-man inspection group. We deem them as very valuable reference for the various field groups in all provinces.

Under the radiant glow of the general party line of socialist construction and the direct leadership of the provincial bureau of hydro-geological and engineering, geological work in the two provinces has made enormous advances in 1958 over those of 1957. Their achievements have been tremendous. They have special field groups for hydrogeology and engineering geology set up and have taken charge of engineering geological surveys for the foundation of the Yung River bridge and dam sites and reservoirs at Pa-fu, Na-ma, Ta-mai and An-lou in the middle section of the Hung-shui river in Kwanghsi. They have also done general hydrogeological survey work for areas short of water such as Nan-ning, Liu-chou and other special districts. They have worked on the water supply of Canton and have done hydrogeological general survey work for the Pearl River delta.

With the increase of areas and mineral varieties explored, a good

deal of hydrogeological work has been done in the process of geological general survey work and exploration. The geological field groups in the T'ung Autonomous Region of Kwanghsi and the twenty two geological groups equipped with specially trained hydrogeological personnel under the Geological Bureau of Kwangtung have furnished the necessary hydrogeological and engineering geological information for industrial and agricultural development and have insured the rational mining of mineral resources.

I. Some Essential Problems in the Rapid Development of Geological Work

1. In hydrogeological work in mine areas, insufficient and poor co-ordination between geological work and hydrogeological work is rather common. Two things are frequently done at different times. Or, in other words, hydrogeological work often is not embarked on until the last moment when geological exploratory survey work is about to be concluded. For example, hydrogeological work had been done only a little due to insufficiency in the original volume done when geological survey-exploration was essentially concluded in such places as the Fu-sui coal mine in Kwanghsi and the flooded shafts of the Yang-ch'un coal field in Kwangtung. Similarly, geological survey-exploration of the T'un-ch'iu iron mine in Kwanghsi was completed in July last year (1958) while hydrogeological work for the place did not end until November. Consequently, reports of the amount of mineral deposits cannot be submitted on schedule. Such delay affects early planning and designing in industry. Due to insufficient attention paid to the collection of hydrogeological data while doing geological survey-exploration and the slackening of collection of geological survey-exploration data in the entire process of survey-exploration, it is very difficult or even impossible to make a hydrogeological appraisal of a mine area on the basis of data obtained from a few hydrogeological drillings or tests. Conclusions drawn in this manner are poor due frequently to insufficiency of data.

Mineral deposits in Kwanghsi and Kwangtung are mostly distributed in limestone Karst areas in which hydrogeological conditions in Karst mine beds are, generally speaking, complex or comparatively complex. In order to investigate and to understand hydrogeological conditions in such areas it is necessary to study the nature and rules of the distribution of karsts and the extent of such development. The purpose of this sort of study usually is to derive a general rule of the horizontal and vertical distribution of karsts from data obtained by means of regional hydrogeological surveying, rock-core investigation and drilling, simple hydrogeological observations and so on. We than make estimates of the future flooding capacity of the projected mine shafts (or open fields of mining). These are made on basis of water contained in strata and calculated with hydrogeological tests. However, many mine areas did not undertake studies of hydrogeological conditions on a comprehensive basis, but on a relatively small survey-section basis. The special hydrogeological drillings thus arranged are somewhat like doing something blindly. As a result it is

hard to reach a conclusion even when the job is completed.

Hydrogeological work was better done in the Lien-yang coal mine field in Kwangtung. They undertook hydrogeological survey work for the large area surrounding the mine area and compiled regional hydrogeological maps together with a quarternary geological map and a morphological map of the surveyed area. Through field observations, information data editing and compiling, rock core investigation and other studies, correct understanding was acquired of hydrogeological conditions of the region and of water-filling factors in mine beds. For example, the Hsiao-pei River cut through all the exposed strata in the mine area. As a result, all surface water runs down into the ground. The ceiling bands of the coal bed are of limestones of Karst development where the appearance of numerous faults is favorable to water-filling in mine beds. Topographically both sides of the coal field are hilly regions, which are good for the accumulation of both surface and underground waters, but complicate hydrogeological conditions in the area. On the basis of these features, hydrogeological work is correctly and accurately completed in the section to be surveyed and all pertinent data obtained from geological survey are fully utilized. The purpose of the various types of work is pretty clear. The manpower needed, time consumed, and amount of work put in are not more than those in ordinary mines. This is one example of a working method which exploits close co-ordination and proper handling of geology and hydrogeology. The opposite of this good example is the Fu-sui coal field in Kwanghsi where hydrogeological survey work for sections was done before regional hydrogeological surveying was started. Consequently they could not correctly arrange the volume of exploratory work in accordance with regional hydrogeological features. Another poor example is the Hai-yang iron mine area in Kwanghsi where the core-rocks fetched in exploratory drilling had been buried long before hydrogeological study was started.

2. An omnipresent problem in both hydrogeological and engineering geological brigades and mine area geological field-groups is that both the variety and the quantity of hydrogeological and engineering geological special equipments are far from satisfying the ever-increasing needs of the work. Due to the shortage of equipment quality, the quantity and efficiency of the work are affected and the time required for the jobs is lengthened.

In probing the loose quarternary strata, both manual and mechanical dash-hit drills are rarely used, for diameters of holes which meet the requirements of hydrogeological tests are hard to make, therefore, mechanical rock-core drills are more common.

In order to be able to use clean and clear water, to drill smoothly and to proceed with hydrogeological tests of strata sectional, tubes and pipes must be thrust down with drilling and stop water by sections. However sectional tubes and pipes, especially those of large diameters, are in very short supply. In the job of water supply in mine areas and the city of Canton, you have drilled holes of small diameter three or four hundred meters deep. If water is not stopped by sections, sectional

hydrogeological tests can hardly be expected to proceed.

Pumping facilities are limited to air compressors and the quantity is rather scanty. There are hardly any water pumps such as the centrifugal pump and rod-lever pulling pump. For example, the Kwanghsi hydrogeological and engineering geological special group, which has a heavy responsibility, has only one air compressor. Due to such shortages, when abundant underground water is to be looked for in regions short of water and when a stratum bearing great amounts of water is discovered, there is no way to lower the water level. For instance, in a number six drilling hole with plenty of water, the water level can be lowered by only seventeen centimeters with the available equipment. There are forty mine areas under the Kwangtung Geology Bureau where pumping tests have to be done, but they have altogether only five air compressors. They can hardly be used by scheduled turns. Thus work is bound to be adversely affected.

Both Kwanghsi and Kwangtung hydrogeological and engineering geological special groups have failed to build laboratories that are able to analyze water samples and determine soil and rock types. Mine-area geological field-groups have not been equipped with simple experimental apparatus like water quality analyzing boxes, and dirt and rock sieving-analyzers. Progress of work is handicapped because timely analytical results can not be obtained. Water sample analysis often loses its representivity when its quality changes due to procrastination.

3. The present number of hydrogeological and engineering geological personnel is felt to be not enough in relation to current standards and assignments. There are 40 mine areas under the Kwangtung Geological Bureau which need to be staffed with hydrogeological personnel, but they have only 40 people. On the average, there is not even one person for each area. Of the 40 most are intermediate technicians and trainees. The Canton Water supply group has only eighteen persons on its hydrogeological technical staff. Hydrogeological personnel of mine-area geological groups and hydrogeological and engineering geological groups of the regional bureau of geology of the T'ung Autonomous Region in Kwanghsi are even fewer in number than those of the Kwangtung Geological Bureau.

II. Some Ideas and Suggestions for a Few Principal Problems Now Existing

Under the leadership of party leaders at all levels and that of provincial, municipal and autonomous region bureaus of geology hydrogeological and engineering, geological work has made tremendous achievements. These special units have made comparatively rapid development. In order to meet the developmental needs and demands of the trend towards a still greater and better leap forward, in order to make hydrogeology and engineering geology a part of the entire army of geology, in order to assure the accomplishment of the primary or central mission of geological work and the prompt opening and starting of regional general hydrogeology survey work and thereby gain an understanding of hydrogeological conditions underground to satisfy the needs of industrial, agricultural and pastoral

production, and in order to do a good job in engineering geological work, necessary measures should be adopted and proper arrangements should be made so that this task will help us solidify, raise our efficiency and further develop.

1. There are many things in hydrogeological and engineering geological work that need to be done in all provinces and regions. Although a number of the things that demanded action have been undertaken by agencies concerned, there is still a lot of the comprehensive type of work such as regional general hydrogeology survey work and special types fo work such as mine-area hydrogeological work which should be conducted simultaneously with general surveying and the exploratory probing of water. In the above-mentioned work, if poor coordination during the past is not corrected in time, the imperative need of water by industrial and agricultural development will be adversely affected. Urban water supply, engineering geology and other departments of production also frequently seek necessary information data from us for their productive work.

To enable the smooth progress of all these works to continue and to make them to serve production better, all provincial, municipal and autonomous region bureaus of geology should establish their respective administrative organizations on basis of principles favorable to the promotion of production. In some provincial mining areas hydrogeological and engineering geological work such as general surveying, engineering, water supply, observation and so forth are all assigned to a single special production brigade. In doing this there are practical difficulties, for the areas are scattered, production tasks are heavy and complex and the energy of a brigade is limited. Often one thing is done while the other is missed. If you try to take care of all things, the result is that nothing is done well and the entire mission is affected. Another thing is that with the sudden increase of mineral exploratory duties, hydrogeological work in mine areas cannot progress accordingly. The unavoidable consequence is failure in making reports of the amount of mineral deposits on schedule. So after a preliminary study of the problems the adoption of the following two types of leadership is appropriate:
a. Departments or offices of hydrogeology and engineering geology should be set up under provincial bureaus to direct technical tasks of mine-area hydrogeology and those of the special brigade, which would be still under the direct jurisdiction of the bureau. In provinces where mine-area hydrogeological work is greater and heavier, it may be wise to establish a department of mine-area hydrogeology to technically direct the hydrogeological work of all mineral exploration field groups. The special brigade would still be an independent production brigade under the direct jurisdiction of the bureau. b. In accordance with working needs, groups or subgroups may be set up by sections directly under the brigade to insure the mobility of specialization. Assistance should be rendered to special and county offices of geology to set up special teams to train trainee-students recommended from lower levels and to gradually build up backbone forces without weakening the main working force. The Bureau Chief or his deputy should personally take command to strengthen leadership and guidance

and make periodical inspections. The responsibilities of the chief engineer ought to be clearly defined. He must take charge of all technical matters. Conditions in which some personnel like only geological work and refuse or are reluctant to take charge of other special technical matters must be corrected without delay. Administrative and technical personnel in charge of brigades should frequently seek for advice from, make reports to and strive to win the support of the leadership above.

2. Due to the increase and growth of hydrogeological and engineering geological units and the heretofore sluggish progress made in special equipment and facilities, the shortage of hydrogeological and engineering geological equipment and facilities now is even more serious than it was before. And in the Big Leap Forward this year the acuteness of the shortage will still exist. So when making supply plans provincial bureaus should give overall consideration to the matter and make unified arrangements. In addition, they should:

a. use substitutes. If we are short of steel water pipes we should try to use rib filter pipes. Bamboo pipes, wood filter pipes, cement-gravel filter pipes, asbestos-cement pipes can be used. Introductory employment of the above-mentioned substitutes in a number of special units has proven successful.

b. make equipments by using repair facilities. Except for machine driven rock-core drills, manual drills used in exploring quarternary loose strata and the constantly-used rod-lever pulling water pumps can be made by service-repair shops and factories. This equipment is simple and economical to make and widely used. Ordinary repair-service shops are all able to make them to meet the impending urgent need.

3. In case there is a shortage of personnel, it should be met through added training in various ways. In addition to requesting the assignment of more college students from the state, it is hoped and recommended that all provincial schools and colleges of geology which have not had separate departments of hydrogeology and engineering geology set up such departments. In addition, training classes and on-the-job training of apprentices should be continued so as to help solve the problem of personnel shortage. The number of college graduates of geology during the last several years is still not enough and is far from meeting the demand. Experience has shown that training classes and on-the-job training of apprentices are two of the most effective ways to solve the problem. At present much of our backbone working strength was trained in this manner.

4. Laboratories for hydrogeological and engineering geological special units should be promptly built so as to aid in acquiring timely analytical results. We ought to fully equip and improve repair-service shops with machines and mechanical equipment and technical workers. Improvements and the creation of special equipment should be encouraged.

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